In The United States Court of Federal Claims

No. 97-21C

(Filed: June 14, 2006)

CHEMICAL SEPARATION TECHNOLOGY, INC., et al.,	*	Trial; Patent infringement case; Acid mine drainage treatment; Literal infringement; Doctrine of equivalents; Portable interim treatment system; Absence of licensing requirement; Integration clause; Modification of purchased item not infringement; Unilateral intention of patentee not controlling; Key elements of patent claims missing in other water treatment facilities; Infringement not demonstrated.
Plaintiffs,	*	
v.	*	
THE UNITED STATES,	*	
Defendant.	*	

Louis M. Tarasi, Jr., and *C. William Kenny*, Pittsburgh, Pennsylvania, for plaintiffs.

Susan L.C. Mitchell, U.S. Department of Justice, with whom was *Assistant Attorney General Peter D. Keisler*, Civil Division, for defendant.

OPINION

ALLEGRA, Judge:

Chemical Separation Technology, Inc. (CST) and Sanford M. Stevenson (Mr. Stevenson) seek compensation from the United States, under 28 U.S.C. § 1498(a), for the unlawful use of two of their patents – U.S. Patent No. 4,749,497 (the '497 patent) and U.S. Patent No. 5,370,800 (the '800 patent) – both of which relate to the treatment of waste water. In this opinion, the third in a series, the court analyzes whether the government unlawfully used the patents at the Summitville Mine site in southern Colorado, and thereby owes plaintiffs damages. After carefully considering the record, the parties' briefs, and the closing arguments herein, the court finds that there was no infringement and that plaintiffs' case, therefore, must be dismissed.

I. FINDINGS OF FACT[1]

Based upon the record, including the parties' stipulations, the court finds as follows:

A. Background

CST, an Idaho corporation, and its president and major shareholder, Mr. Stevenson, own the '497 patent and the '800 patent, the methods embodied in which are used in an apparatus constructed by CST known as the "portable interim treatment system" or "PIT System." Using a series of chemical agents, the PIT System precipitates and removes hazardous minerals and compounds from acidic mine waste water. A critical feature of the "method" is the addition of cationic and/or anionic polymers[2] to the polluted water, thereby causing the precipitated minerals to clump together (flocculate). To better understand this method, a short discussion of acid mine drainage (AMD) and the processes commonly used to treat it follows.

When water and oxygen react with rocks containing sulfur-bearing minerals (such as iron pyrite, $FeSe_2$), AMD, also referred to as acid mine leachate or mine leachate, is formed. One of the experts summarized this chemical reaction, as follows, in his report –

> The process is initiated by the oxidation of sulfur in the pyrite by dissolved oxygen in the water, releasing iron in the ferrous form (Fe^{2+}) and sulfur as sulfate (SO_4^{2-}). Hydrogen ions (H^+) that increase the acidity of the solution and lower the pH are also produced. If the ferrous iron in the AMD solution is oxidized by oxygen . . . , ferric iron (Fe^{3+}) is formed that can oxidize, like oxygen, the sulfur in the pyrite to form more sulfate, ferrous iron, and acid. This essentially self-propagating part of the overall reaction that creates AMD tends to be catalyzed by iron-oxidizing bacteria, making the AMD generation process quite complicated.

AMD routinely contains not only iron species and sulfuric acid, but also significant amounts of calcium and aluminum; heavy metals such as copper, lead and mercury; and anionic forms of arsenic and chromium. Some of these materials are leached from minerals that come into contact

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[1] As appropriate, this segment incorporates findings made by this court in its earlier opinions. *See Chem. Separation Tech., Inc. v. United States*, 51 Fed. Cl. 771 (2002) (*CST II*); *Chem. Separation Tech., Inc. v. United States*, 45 Fed. Cl. 513 (1999) (*CST I*).

[2] A polymer is a macromolecule, a string of organic or inorganic molecules, formed by the chemical union of at least five identical monomers, which are simple molecules or compounds usually made of carbon and exhibiting simple structure and low molecular weight. *See Hawley's Condensed Chemical Dictionary* 900 (13th ed. 1997). A cationic polymer exhibits a positive ionic charge, while an anionic polymer exhibits a negative ionic charge. *Id.* at 77, 223-24. Polymers aid in flocculation by forcing suspended metal particles to aggregate into clumps or tufts as they pass through a solution containing these long chains of inorganic or organic compounds. *Id.* at 506.

with AMD, with the pH of the AMD varying in accordance with the acid neutralizing properties (or lack thereof) of such minerals.[3]

AMD must be treated before being discharged into the environment. That treatment typically includes the following steps: neutralization of the acidity, including increasing the pH; removal of toxic materials, such as copper and arsenic; and removal of elements such as iron and aluminum that form precipitates that destroy aquatic habits and diminish water quality. As described in an EPA Design Manual in the record –

> When metals precipitate from wastewater, the particles they form vary in size but are no longer part of the liquid; a liquid containing such solid particles becomes a "suspension;" the term 'colloidal suspension' is used when the solid particles are very small and difficult to settle. Most of the precipitated metals in suspension will naturally settle, or form a sediment, under the force of gravity. This process of settling, or clarification, separates the precipitated metals from the waste water, and the treated water is then discharged. This treated water is called "supernatant" or "overflow," and the sediment is called "sludge" or "underflow."

Because the precipitation of metals involves reactions with oxygen, hydrogen, water, and other constituents of wastewater, sludge is mainly composed of hydrous metal compounds, such as metal hydroxides, rather than pure metal ions. Water treatment steps preceding settling are designed to promote precipitation, so that separation of metals can occur: pH adjustment reduces solubility of metals that form complexes with hydrogen, thus initiating the formation of precipitates, while oxidation changes the ionic form of the metal, reducing solubility further and increasing the extent of precipitation. In addition, pH levels must be adjusted to meet EPA discharge limits. Mixing (also referred to as agitation) is required to disperse the pH-adjusting chemicals in the wastewater, and may be necessary to contact the oxidant with the metal as well.

Coagulation and flocculation processes aid in the precipitation and settlement of metals. A coagulant is a chemical that suppresses a particle's electric charge so that it will aggregate with other particles, forming agglomerations of solid metals large and heavy enough to settle out.[4]

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[3] The pH of water is a measure of the hydrogen ion activity and represents an indirect indication of its acidity or alkalinity. Generally speaking, the higher the pH, the more alkaline the water; the lower the pH, the more acidic it is, while a pH of 7 indicates neutrality. Water at either pH extreme possesses potentially harmful characteristics, and is thus considered a pollutant. AMD is normally neutralized to a pH between 6 and 9 before it is discharged into the environment.

[4] Coagulants may be chemicals added specifically to induce coagulation, such as iron and aluminum salts, or pH adjustment chemicals, such as hydrated lime ($Ca(OH)_2$). Materials already present in the wastewater may act as coagulating agents, without the need for chemical addition; for example, iron, aluminum, and manganese, once precipitated, promote precipitation of other metals.

Such agglomerations are sometimes called flocculations or, simply, "flocs." Flocculation generally refers to the process of binding together large numbers of suspended or coagulated solids. Flocculants are molecules that have many atoms and become highly ionized when dissolved, so that each flocculant molecule has many charged "sites" available to attract suspended or coagulated solids, and enmesh with other flocculant molecules. As the ionized sites bind with coagulated solids or other flocculant molecules, a "floc" builds up consisting of a large number of like particles in a process called "bridging." Flocculation aids the process of settling by causing formation of larger, faster settling particles. The use of polymers as flocculants for removal of iron precipitates from water has been known since at least 1971, and for removal of iron, manganese, zinc, copper, lead, and chromium solid compounds since at least 1976.

B. Description of the Patents at Issue

As noted, the '497 and '800 patents both relate to the treatment of waste water and are used in the PIT System, the device marketed by CST.

1. The '497 Patent

On January 21, 1986, Mr. Stevenson, along with Richard S. Kanzleiter, Thomas G. Simonetti, and Kenneth E. Ball, applied to the United States Patent and Trademark Office (the PTO) for the grant of a patent upon a "Method and Apparatus for Treatment of Acidic Water," Ser. No. 820,955. The patent, as filed, was found by a PTO examiner to be obvious in light of Spinola, U.S. Patent No. 3,541,008 (Spinola), in view of Boester, U.S. Patent No. 3,210,053. After unsuccessfully attempting to distinguish his method from prior art, Mr. Stevenson abandoned the application and filed a continuation application with a preliminary amendment to the claim. The PTO continued the application, which was refiled on August 7, 1987, and then granted the continued application on June 7, 1988, at Patent No. 4,749,497. Subsequently, the '497 patent was assigned to CST by the named inventors, as recorded in the PTO on November 2, 1987.

The abstract of the '497 patent describes the invention as follows:

> A method and apparatus for treating acidic water, such as mine acid water is provided. The apparatus is readily portable and comprises a reaction vessel having an aerator motor operatively associated therewith. Water to be treated is received within said reaction vessel and is treated by having a neutralizing agent and oxidant by way of the aerator motor introduced simultaneously into the system. Because of the instantaneous elevation of pH resulting from the simultaneous introduction of oxidant and the neutralizing agent, the reaction time is greatly reduced and the equipment required is small, compact and easily transported.

According to its summary, the patent "invention provides an apparatus and method of water treatment for the purpose of precipitating metals and neutralization of acid found in waters such as that which results from mine drainage." The patent's "Description of Preferred Embodiment" further explains –

> [t]he apparatus preferably consists of a reaction vessel having a series of baffles therein, a pH monitoring probe and an aerator motor mounted on a skid and having the necessary piping connecting the aforementioned equipment. The apparatus is connected to a source of the raw water, such as a stream. The power source which may be, for example, a portable generator or line power, is connected to the apparatus to energize the system. A caustic substance is injected into the system which neutralizes the acid in the water. At generally the same point, an aerator introduces oxidant into the influent flow stream. The neutralization means and aeration means are in generally close proximity and oriented in generally the same axial position. The flow stream experiences substantially instantaneous elevation of pH and the oxidation rate required for the treatment is thereby generally accelerated. This eliminates the need for long contact times for treatment chemistries to occur.

The '497 patent consists of 9 claims, elements of which were construed by this court in its earlier *Markman* ruling, either independently or consistent with the parties' stipulation. *See CST II*, 51 Fed. Cl. at 777-80, 784-90. The first claim reads:

> 1. A water treatment apparatus comprising,
> a reaction vessel,
> a source of acidic or metal-bearing water,
> influent pipe means[5] operatively connected to said reaction vessel for delivering said water to be treated from said water source to said reaction vessel,
> aerator means having a shaft extending therefrom into said reaction vessel said shaft having a discharge end for discharging oxidant,
> said aerator means having agitation means,
> said influent pipe means disposed generally adjacent to the discharge end of said aerator shaft,

[5] In its *Markman* ruling, the court held that the "influent pipe means" is designed to "deliver [the metal-bearing] water to be treated from said water source to said reaction vessel" and corresponds only to items 9 and 18 in Figure 3 of the patent. *CST II,* 51 Fed. Cl. at 778. Various figures in the patents were reproduced in this court's *Markman* ruling and, though referenced herein, are not reproduced. *See id.* at 778, 787, 792.

a neutralizing agent feed line means leading from neutralizing supply means[6] into said reaction vessel for delivering neutralizing agent,
said neutralization feed line means operatively associated with said aerator shaft such that a discharge end of said neutralizing agent feed line is positioned generally adjacent to said agitation means,
pump means operatively associated with said reaction vessel,
power source means operatively associated with said reaction vessel for energizing said apparatus,
effluent discharge pipe means operatively connected to said reaction vessel for discharging the water, and
automated metering and control means[7] for delivering said neutralizing agent into said reaction vessel through said neutralizing agent feed line means and oxidant from said aerator means at substantially the same time, whereby said oxidant impinging upon the water entering said reaction vessel will aerate said water and establish mixing therein so as to enhance efficiency of distribution of said neutralizing agent in said water to reduce reaction time and enhance efficiency of said reaction.[8]

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[6] The court held that "neutralizing supply means" is definite and that the structure associated therewith is "a container containing a caustic, usually liquid, that is exterior to the tank, is portable and readily moveable, and is connected to the caustic feedline 19." *CST II,* 51 Fed. Cl. at 784-85.

[7] The court ruled that "automated metering and control means" is not indefinite and refers to the metering pump 12 and control panel 13 in Figure 2 of the patent. *CST II*, 51 Fed. Cl. at 786-87.

[8] The parties stipulated to the construction of the following elements in claim 1 of the '497 patent, as follows:

a. "means" elements is construed as "means-plus-function elements and limited to the corresponding structure described in the specification and equivalents thereof;"

b. "aerator means having a shaft extending therefrom into said reaction vessel said shaft having a discharge end for discharging oxidant, said aerator means having agitation means" is construed as a "means-plus-function elements, construed together, corresponding to motor 6, shaft 15, aerator prop16 and discharge tip 17 in Figure 3, with aerator prop 16 providing agitation;"

c. "a neutralizing agent feed line means . . . for delivering neutralizing agent" is construed as a "means-plus-function element, describing the function of delivering the neutralizing agent and corresponding to caustic feed line 19;"

Claim 2 of the '497 patent reads:

> The apparatus of Claim 1, wherein said influent pipe is disposed closely adjacent to the discharge end of said aeration shaft, whereby the relative general proximity of said water source means, said neutralizing agent, feed line discharge end, and said agitation means will enhance the efficiency of the reaction.[9]

Claim 3 reads:

> A method of treating acidic water comprising,
> providing a treatment unit comprising aerator means,
> said aerator means having a shaft extending therefrom into said treatment unit and said aerator means having agitation means, influent pipe means disposed generally adjacent to the discharge end of said aerator shaft and neutralizing agent feed line means disposed generally adjacent to the exit of said aerator means,
> providing means for introducing a source of acidic or metal-bearing water into a treatment unit,[10]

> d. "pump means operatively associated with said reaction vessel" is construed as a "means-plus-function element, describing the function of pumping the caustic and corresponding to metering pump 12;"
>
> e. "power source means operatively associated with said reaction vessel for energizing said apparatus" is construed as a "means-plus-function element, describing the function of energizing the apparatus and corresponding to a portable generator or line power;" and
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> f. "effluent discharge pipe means operatively connected to said reaction vessel for discharging the water" is construed as a "means-plus-function element, describing the function of discharging the water and corresponding to effluent conduit 11."

CST II, 51 Fed. Cl. at 784. In addition, regarding the portion of claim 1 that reads "whereby said oxidant impinging upon the water entering said reaction vessel will aerate said water and establish mixing therein so as to enhance efficiency of distribution of said neutralizing agent in said water to reduce reaction time and enhance efficiency of said reaction," this court held that this element was definite and that the "reaction" referred to is the introduction of waste water, neutralizer, oxidant and agitation. *Id.* at 778-80.

[9] The court held that this claim is definite and was depicted in Figure 3 of the patent. *CST II,* 51 Fed. Cl. at 788.

[10] "[M]eans for introducing a source of acidic or metal-bearing water into a treatment unit" – the court held that this element of claim 3 is definite and is a means-plus-function associated with influent conduit 9, conduit 18 and conduit 22 in Figure 3 of the patent. *CST II,* 51 Fed. Cl. at 788-89.

introducing said water to be treated into said treatment unit,
introducing a neutralizing agent into said treatment unit,
introducing oxidant at generally the same point at which said neutralizing agent is introduced into the water to be treated,
agitating said water, oxidant, and neutralizing agent,
providing a means for receiving precipitants from said mixture, and
discharging treated water from said treatment unit.[11]

Claims 4 through 9 of the patent are all dependent upon claim 3. Claim 4 of the '497 patent reads: "The method of claim 3, wherein said primary oxidant source is air." Claim 5 reads: "The method of claim 3, wherein the neutralizing agent and the oxidant are substantially simultaneously introduced into said water."[12] Claim 6 reads: "The method of claim 3 wherein said method is employed in treating mine acid water." Claim 7 reads: "The method of claim 3 wherein prior to treatment, said water is removed from a stream and introduced into said treatment unit; and after treatment said treated water is discharged into a settling structure for solids removal." Claim 8 reads: "The method of claim 3 wherein prior to treatment, said water is removed from a stream and introduced into said treatment unit; and after treatment said treated water is discharged into a settling structure then into said stream." Claim 9 reads: "The method of claim 3 wherein the pH is substantially instantaneously elevated."[13]

In *CST II*, the court held that defendant's arguments regarding the validity of the '497 patent were not well-founded. *See CST II,* 51 Fed. Cl. at 793-801.

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[11] The parties stipulated to the construction of the following elements in claim 3 of the '497 patent, as follows:

a. "means for receiving precipitants from said mixture" includes a thickener, a clarifier, and a settling pond;

b. other "means elements"is definite; and

c. "generally adjacent" and "generally the same point" are definite.

CST II, 51 Fed. Cl. at 784.

[12] As to claim 5, the parties stipulated that the element "substantially simultaneous" is definite. *CST II,* 51 Fed. Cl. at 784.

[13] "[W]herein the pH is substantially instantaneously elevated" – the court construed this phrase to mean "a level of pH elevation caused by introduction of a caustic, *e.g.*, sodium hydroxide, potassium hydroxide, magnesium hydroxide, barium hydroxide, and combinations thereof." *CST II,* 51 Fed. Cl. at 789.

2. The ‘800 Patent

The ‘497 patent is the preferred embodiment of the primary reaction tank used in the method of the second patent at issue in this case, the ‘800 patent. On May 25, 1993, Mr. Stevenson filed an application with the PTO for a “Method for Removing Metal Compounds from Waste Water.” The PTO rejected the original claims made in the patent application in light of prior art, as obvious in light of Walker, U.S. Patent No. 5,013,453, in view of Spence, U.S. Patent No. 4,758,353. Plaintiffs amended their claim and added limitations to claim 1 to distinguish it from prior art. The PTO granted this application on December 6, 1994, at Patent No. 5,370,800.

According to its abstract, this invention provides:

> [a] method for removing metal compounds from waste water comprising the steps of adjusting the pH of the water to from 5 to 12 and preferably 6 to 9; aerating the waste water; adding a flocculating agent to the water and allowing floccules including metal compounds to form; and separating said floccules including metal compounds from the water. An apparatus for carrying out this method is also disclosed.

As stated in its summary, the object of the ‘800 patent is “to provide an improved method and apparatus for removing precipitate or suspended metal compounds from waste water.” More specifically:

> [i]n this method the pH of the water is first adjusted from 6 to 10. Preferred neutralizing agents are sodium hydroxide, and anhydrous ammonia when the waste water is overly acidic or sulfuric acid or hydrochloride acid when it is overly basic. The water is also aerated to a dissolved oxygen concentration of from 0.01 lb./hr. to 70 lb./hr. at a raw water input flow rate of 50 gal./min. to gal./min. to 500 gal./min. Neutralization and aeration may preferably be done simultaneously. A polymeric flocculating agent is then added to the water. The metal compounds are then flocculated, and the flocculated metal compounds are separated from the water by means of a rotary drum thickener, clarifier[14] or other suitable means. A preferred flocculating agent is an anionic or cationic polymer wherein the use of an anionic polymer would be preferred for primary clarification or settling purposes while the cationic polymer would be preferred for dewatering purposes. The flocculated metal compounds are then further dewatered in a belt filter press or other suitable apparatus.

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[14] A clarifier is a vessel in which water is separated from suspended solvents – it essentially allows the solvents to settle out.

The '800 patent consists of 25 claims. As with the '497 patent, various elements in these claims were construed by the court in its *Markman* ruling. *See CST II*, 51 Fed. Cl. at 780, 790. Claim 1 of the '800 patent reads:

> A method of removing[15] metal compounds selected from iron, manganese, aluminum, zinc, copper, lead, arsenic and chromium from waste water comprising the steps of:
>
> (a) adjusting the pH of the waste water to from about 5 to about 12;[16]
> (b) aerating the waste water;[17]
> (c) agitating the waste water, where steps (a), (b) and (c) are carried out simultaneously in a reaction tank and waste water is aerated in said reaction tank to provide a dissolved oxygen concentration at from about 0.01 lb./hr. to about 70 lbs./hr.[18] at a waste water input flow rate of from about 50 gal./min. to about 500 gal./min. for a metals concentration of from about 50 mg./l. to about 1,000 mg./l.;[19]
> (d) then adding a flocculating agent polymer selected from a group consisting of cationic and anionic polymers to the water and allowing floccules including said metal compounds to form; and

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[15] In its *Markman* ruling, the court construed the phrase "removing" to mean "to take away or eliminate." *CST II,* 51 Fed. Cl. at 780-81.

[16] The court held that the portion of claim 1 that states "[a]djusting the pH of the water to from about 5 to about 12" is not indefinite and refers to "bringing to a pH point within the range specified that optimizes the precipitation of metals, said point to be determined by reasonable experimentation." *CST II,* 51 Fed. Cl. at 781-83.

[17] The court construed the phrase "aerating the water" to mean "supply air and other gaseous oxidants to the waste water." *CST II,* 51 Fed. Cl. at 790-91.

[18] The court ruled that the language of claim 1 which states "aerated in said reaction tank to provide a dissolved oxygen concentration at from about 0.01 lb./hr. to about 70 lbs./hr.," considered in conjunction with that portion of the claim that recites gallonage and milligram ranges, refers to a rate of aeration and that the ranges so specified were not intended as limitations on the patent. *CST II,* 51 Fed. Cl. at 783-84.

[19] Regarding the limits "about 50 gal./min. to 500 gal./min." and "about 50 mg./1 to about 1,000 mg./1." – the court held in its *Markman* ruling that "these ranges when viewed in conjunction with the ranges of dissolved oxygen concentration indicated in the patent, allow for the calculation of a rate of aeration and are not intended as limits on the patent involving certain flow rates or metal concentrations." *CST II,* 51 Fed. Cl. at 791.

(e) then separating said floccules including said metal compounds from the water.[20]

Claims 2-25 of the '800 patent provide:

2. The method of claim 1 wherein there is added the further step (f) of further dewatering the floccules separated in step (e).

3. The method of claim 2 wherein additional flocculating agent polymer is added to at least a portion of the waste water containing the flocculated metal compound separated in step (e).

4. The method of claim 3 wherein after the addition of the additional flocculating agent polymer, the flocculated metal compound is dewatered in step (f) in a belt filter press.

5. The method of claim 4 wherein there is water which is removed in step (f) and said water removed in step (f) is removed to a polishing pond.

6. The method of claim 2 wherein in step (e) separation is conducted by means of a clarifier.

7. The method of claim 6 wherein additional flocculating agent is added to at least a portion of the flocculated metal compound separated in step (e).

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[20] The parties stipulated to the construction of the following elements in claim 1 of the '800 patent, as follows:

a. "metal compounds" is construed as "precipitated or suspended compounds of metal;"

b. "selected from iron, manganese, aluminum, zinc, copper, lead, arsenic, and chromium" is construed as "selected from iron, manganese, aluminum, zinc, copper, lead, arsenic, and chromium, either alone or in combination with themselves or other materials and in any initial form so long as they are precipitated or suspended;"

c. "comprising" is construed as "comprising at least;"

d. "agitating the waste water" includes agitation by any means, including by aeration and by a mixer;

e. "flocculating agent polymer" includes a polyelectrolyte; and

f. "a group consisting of cationic and anionic polymers" is limited to cationic and anionic polymers but includes any cationic or anionic polymer.

CST II, 51 Fed. Cl. at 790.

8. The method of claim 7 wherein after the addition of the additional flocculating agent polymer, the flocculated metal compound is dewatered in step (f) in a belt filter press.

9. The method of claim 8 wherein there is water removed in step (f) and said water removed in step (f) is removed to a polishing means.

10. The method of claim 2 wherein in step (e) separation is conducted by means of sequential treatment in a clarifier and a rotary drum thickener.

11. The method of claim 10 wherein additional flocculating agent polymer is added after the clarifier and then again after the rotary drum thickener.

12. The method of claim 11 wherein after the additional flocculating agent polymer, the flocculated metal compound is dewatered in step (f) in a belt filter press.

13. The method of claim 12 wherein there is water removed in step (f) and said water removed in step (f) is removed to a polishing pond.

14. The method of claim 11 wherein water removed in step (f) is removed to a settling pond.

15. The method of claim 2 wherein in step (e) separation is conducted by means of a settling pond.

16. The method of claim 15 wherein additional flocculating agent is added after the settling pond.

17. The method of claim 16 wherein after the additional polymer is added the flocculated metal compound is dewatered in step (f) in a belt filter press.

18. The method of claim 1 wherein in step (a) the pH is adjusted to from about 6 to about 9.

19. The method of claim 1 wherein in step (a) the pH is adjusted by adding a neutralizing agent selected from sodium hydroxide, anhydrous ammonia, sulfuric acid and hydrochloric acid.

20. The method of claim 1 wherein the polymer is a cationic polymer which is used for dewatering purposes.

21. The method of claim 1 wherein the polymer is an anionic polymer which is used for primary clarification purposes.

22. The method of claim 1 wherein the polymer is a anionic polymer which is used for settling purposes.

23. The method of claim 1 wherein the polymer is added in a dilute concentration of from about 0.5% to about 1.5% by weight.[21]

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[21] Regarding the phrase "adding in a dilute concentration of from about 0.5% to about 1.5% by weight" in claim 23, the court held in its *Markman* opinion that one skilled in the art would know where the polymer referred in claim 23 was to be introduced in the method described by claim 1. In addition, the court ruled that the dilution referred to in claim 23 is that of the polymer before, rather than after, it is added to the waste water stream. Lastly, the use of the term "about" does not render claim 23 indefinite. The court concluded that one skilled in the art would view the term "about" as indicating "approximately." *CST II,* 51 Fed. Cl. at 791-93.

24. The method of claim 1 wherein after step (e) a portion of the separated water is removed to a polishing pond.

25. The method of claim 1 wherein in step (e) separation is conducted by means of a rotary drum thickener.[22]

Previously, this court found that claims 1-7, 10, 18-21, and 23-25 of the '800 patent are invalid as in violation of the on-sale doctrine of 35 U.S.C. § 102(b). *CST II*, 51 Fed. Cl. at 802-18. Additionally, it held that claims 1-5, 18-21, and 23-25 of the '800 patent also are invalid as obvious under 35 U.S.C. § 103(a). *Id*. The court rejected the remainder of defendant's assertions regarding the validity of the '800 patent. *Id*. As a result**,** claims 6-9, 11-17, and 22 – which modify the method in claim 1 in various fashions – remain valid in the '800 patent.

C. Facts Surrounding the Alleged Infringement

1. The Initial Sale of the PIT System

The Summitville Mine is located about 25 miles south of Del Norte, Colorado, near the historic mining town of Summitville, Colorado. Since placer gold was discovered downstream from Summitville in 1870, various mine activities have been conducted there. In 1984, Galactic Resources, Inc. (Galactic) leased mining claims in the area. Two years later, in 1986, Summitville Consolidated Mining Company, Inc. (SCMCI), a wholly owned subsidiary of Galactic, began open-pit gold mining operations at the Summitville site, using a cyanide heap leach process for gold and silver recovery. Under this process, SCMCI blasted ore from the South Mountain, producing an open pit. The higher grade of that ore, that is, with a higher assay of gold, was then crushed and hauled to a heap leach pad, a 48-acre lined pond where a solution of sodium cyanide was sprinkled from piping atop the mass. The cyanide solution percolated through the layers of ore to leach out gold and other heavy metals, such as silver, copper, zinc,

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[22] The parties stipulated to the construction of the following elements in claims 2, 9, 21, and 22 of the '800 patent, as follows:

a. Claim 2: "further dewatering the floccules separated in step (e)" as meaning "processing the floccules separated in step (e) in a second or later stage;"

b. Claim 9: "polishing means" is limited to a polishing pond, a settling pond, and a polishing tank, and their equivalents;

c. Claims 21: "used for primary clarification purposes" is construed as "in a first stage clarifier;" and

d. Claims 22: "used for settling purposes" is construed as "in a settling pond or tank."

CST II, 51 Fed. Cl. at 790.

cadmium, and manganese. The "pregnant" solution containing cyanide, gold and other metals was then pumped to a gold recovery plant, which used activated carbon technology to strip gold and silver from the solution. Lower grades of ore were deposited in the cropsy waste dump.

On April 14, 1992, CST made a formal offer to sell a waste water treatment system utilizing the PIT System to SCMCI. Its proposal relied upon a discharge permit that SCMCI had received from the State of Colorado, describing the design criteria for what was to be sold in accordance with the terms of that permit, as: "[u]tilization of 50% NaOH solution at 100 GPM raw water and 2200 Mg/l acidity, will be approximately 14 gallons per hour respectively in the worst case scenario." On April 24, 1992, SCMCI accepted this offer, and on May 5, 1992, its agent signed a purchase order. The order contained no license limiting the operation of the treatment facility to a particular flow or copper removal rate. It contained the following integration clause:

> ENTIRE AGREEMENT: This contract contains the entire agreement of the parties. It may not be modified or terminated orally, and no claimed modification, termination or waiver shall be binding on Buyer unless in writing signed by a duly authorized representative of Buyer. No modification or waiver shall be deemed effected by Seller's acknowledgment or confirmation containing other or different terms. All titles to clauses contained in this order are for identification only and shall not be construed as being a substantive part of this agreement.

Paragraph II of the order states that "[a]ll invoices, packages, shipping notices, instruction manuals, and other written documents affecting this order shall contain the applicable purchase order number."[23]

A PIT System was installed at the Summitville site on July 15, 1992. The PIT System operations manual, which was provided to SCMCI at the time the system was installed, stated:

> Chemical Separation Technology, Inc. (CST) has developed this manual specifically for the operation of the Summitville Mine - Reynolds Adit. Please be advised that the process technology and apparatus supplied is patented and

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[23] The Bill of Sale for the PIT system also made no reference to a license limitation and covenanted only that –

> [s]eller hereby covenants (i) that it is the lawful owner of the Equipment (ii) that the Equipment is free from all liens, claims, security interests and other encumbrances, (iii) that is [sic] has the right to sell the Equipment, and (iv) that it will warrant and defend the same against the lawful claims and demands of all persons.

Exhibit A attached to the bill of sale describes a 100 g.p.m. thickener, but did not refer to any throughput limitation or restriction on the amount of copper that could be removed.

> confidential and all written material and programs are copyrighted by Chemical Separation Technology, Inc.

The manual admonished:

> Any duplications, changes or alterations performed on this unit or duplications from this unit without the written consent of Chemical Separation Technology, Inc. shall be in violation of CST's patent protection and shall be punishable under the patent laws of the United States of America, The United Kingdom, the European Community, and will void all warranties.

Nothing therein indicated that the holder of the PIT System was licensed to use that system at some prescribed rate, *e.g.*, 100 gallons per minute.[24]

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[24] Regarding this issue, Mr. Stevenson testified:

> Q: And what do you perceive to be the restriction on the PITS system that you sold to Summitville or SCMCI?
>
> A: When SCMCI bought that system, it was to remove 40 pounds of copper per day and treat 100 gallons a minute . . . . We designed it for 100 GPM . . . or 40 pounds per day.
>
> Q: So those two restrictions you're talking about, the 40 pounds of copper removal per day and the 100 gallon per minute through electric throughput system, were just part of the design of the PITS that you –
>
> A: They were part of the design, they were part of the purchase order agreement with SCMCI, and ultimately, they were part of all the correspondence to SCMCI . . . that was the limit.
>
> Q: So you are testifying that there is a written agreement with SCMCI that there is some throughput limitation on the PITS system and some limit on the amount of copper that they can remove per day?
>
> A: There was no written agreement that says this is a licensed amount. It was understood . . . in the industry . . . that the throughputs were designated both in the design and the purchase order when they bought the system.

While Mr. Stevenson asserts that he told SCMCI employees about this limitation, he admitted that he did not specifically tell them that exceeding the limits would constitute a breach of a license. Moreover, other documents in the record, associated with the sale of the PIT System to SCMCI, contradict Mr. Stevenson's assertion that 100 gallons per minute was a set limit. Indeed, at a later point in his testimony, Mr. Stevenson indicated that he did not include a license

SCMCI utilized the PIT System for a short time, but soon abandoned the site. On December 4, 1992, it declared bankruptcy. At this time, Galactic agreed to staff the site only until December 15, 1992, raising concerns that the leach pond might be compromised, with disastrous consequences. After meeting with state officials, the Environmental Protection Agency (EPA), with support from the United States Bureau of Reclamation (BOR), assumed control of the site on December 16, 1992, and immediately initiated a clean-up action to prevent release of cyanide and heavy metal-laden water from the heap leach pad. In addition to the heap leach pond, the EPA inherited a host of contaminated sources, collection points, and leftover equipment, including two large waste rock piles (a cropsy waste pile and a north waste dump); an open pit area; several underdrains, French drains[25] and water impoundments; adits (a horizontal opening that accesses underground working for drainage purposes); and three waste water treatment systems. An outside firm, the Environmental Chemical Company (ECC), was retained to serve as the emergency response contractor to manage the clean-up of the site. ECC entered the site in the latter part of December of 1992.

2. The Summitville Site

When EPA, the BOR and ECC took over the site, contaminated water was present at, *inter alia*, the heap leach pad, the Cropsy waste pile, the French Drain sump, and the Reynolds adit. The heap leach pad was within a few feet of overflowing, prompting concerns that it would be compromised if steps were not taken to relieve it prior to the spring thaw. The EPA's initial pollution report described the dire conditions at the site as follows:

> The Summitville Mine is located about 25 miles south of the Del Norte, CO in Rio Grande County. The mine is near the old historic mining town of Summitville which is at an altitude of 11,800 feet. The mine is a large tonnage open pit heap leach gold mine. Mined ore is crushed, sized, and stacked on a lined heap (in this case the heap is designed more like a pond allowing water to accumulate - the water is pumped out from the bottom rather than drained from one end). A solution of sodium cyanide is used to leach gold from the ore when sprinkled on the heaped ore. Gold is recovered from the solution by carbon absorption. The mine has operated since July, 1986. The mine ceased to mine ore and load the heap in 1991. But, leaching the heap continued and it is now spent. The heap has 170,000,000 gallons of cyanide and heavy metal contaminated water in it and could overtop in one month. There are three separate water treatment systems at the site treating heap water and other contaminated waters sources. On December 3, 1992, [SCMCI] announced it would file for bankruptcy on

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agreement in the SCMCI deal because he wanted to "build a customer base, rather than start arguing . . . with the restrictive restrictions and threats of lawsuits."

[25] A French drain is a drain with no pipe. The water collects in a gravel or stone filled channel that starts from the surface or just below it.

> December 4th. . . . . [A]ll water treatment operations will cease, pipes, equipment, and related facilities will freeze up and be damaged and contaminated water will be released in very significant amounts to Wightman Fork and the Alamosa River.
>
> * * * *
>
> Although the mine operators had a [National Pollution Discharge Elimination System Permit under the Clean Water Act], water has only periodically been released from the site since the project inception in July 1986. Water has been allowed to accumulate in the heap by recirculation. Also, additional ore has been continually added to the heap which exacerbated water storage capacity. All site fluids are continuously recirculated through the heap and water processing plants. The recirculating fluid is high in copper and cyanide, as well as other metals.

Harold Hays Griswold, the author of this report, testified at trial that "[t]he place was essentially a huge mess in terms of a mine site, with contaminated water coming from just about everywhere that had been backed up behind, or in a heap leach pad, and behind a heap leach pad in a Cropsy waste pile and in the mine pit itself coming out of the Reynolds adit."

The clean-up included treatment of waste water, which ECC performed using, in part, the PIT System already installed at the site. By the time it left the mine site, SCMCI also had converted a cyanide destruction plant (CDP) and a metals removal plant (MRP) from mining operations to water treatment. In 1993, ECC issued a request for proposals seeking contract bids for enhancing the capacity of the PIT System. CST submitted a proposal, but ECC chose not to award the contract and performed the work itself.

At issue in this case are four major water treatment facilities at the Summitville Mine Site operated by defendant that plaintiffs allege infringed various claims of the '497 patent and the '800 patent: (i) the PIT System; (ii) the Cropsy Water Treatment Plant (CWTP); (iii) the alleged French Drain Treatment Plant (FDTP); and (iv) the Water Treatment Plant. A brief description of each of these follows.

- **The Portable Interim Treatment System**. As noted, the PIT System had been delivered to SCMCI and installed by CST. It was comprised of a reaction vessel, a 2000-gallon tank, with an influent pipe, caustic line and pH probe, and an aerator. The PIT System was used to treat water from the Reynolds adit. After its arrival at the Summitville site, EPA determined that, to deal with the impending snow melt, the PIT System needed be altered to treat more AMD. Thereafter, the PIT System was modified to allow it to run continuously and to increase the amount of water fed into

the system by altering the pipe and pump size; modifications were also made to the clarifiers.[26]

- **Cropsy Water Treatment Plant (CWTP).** Defendant also undertook to remove the acid mine drainage generators and treat AMD from the Cropsy Waste pile and the French Drain.[27] In June 1993, the EPA discussed installing a system for the treatment of the Cropsy Water solution. The EPA's RFP, published in October

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[26] Treatment data indicates that in September and October of 1993, the PIT System was functioning at roughly 191 gallons per minute. According to a subsequent RFP, dated August of 1993, that summarized the changes made under the earlier contract –

> The PITS system was retrofitted completely to increase capacity and improve efficiency. The following activities were carried out:
>
> a. A larger pond was built near the portal of the adit to handle higher flow rates and surges in the flow rate. This pond was lined with PVC.
>
> b. All piping in the system was enlarged to handle higher capacities.
>
> c. The two settling tanks were redesigned for higher settling efficiencies . . .
>
> d. New larger capacity metering pumps were installed to handle the higher flow rates.
>
> e. A new larger capacity pump was installed in the pond to pump higher volumes to the treatment system.
>
> f. A 4" line was installed from the PITS to the MRP to channel the sludge to the filter press for improved sludge handling.
>
> g. Two new tanks of capacity 2000 and 1200 gallons were added to improve sludge handling capabilities.

This document indicates that in May of 1993, "an average of 450 to 600 lbs. per day of copper were removed from the Reynolds discharge," adding that "[p]lans are in place to attempt to quadruple this amount." In his testimony, Mr. Stevenson confirmed that he saw the modifications when he visited the site on November 3-4, 1993.

[27] The Cropsy waste pile backed up into the heap, was in the same valley, and contained very acid-generating material. The French Drain was a sump designed to capture water leaking from the heap and the Cropsy waste pile.

1993, proposed "install[ing] a water treatment plant near the pumphouse to treat all ground water in the Cropsy pile . . . [to] prevent the overflow of acidic water into the leach pad and also reduce the flow of acidic waters to the French Drain." Thereafter, EPA utilized AMD treatment equipment donated by Homestake Mining to create the Cropsy Water Treatment Plant (CWTP), which became operational in 1994. The CWTP treated waste water collected at the toe of the Cropsy Waste Dump, as well as water from the French Drain, located underneath the heap leach pad. ECC and the BOR authored drawings reflecting the CWTP's operational sequence and equipment, along with an operations manual to run the plant.

- **French Drain Treatment Plant (FDTP).** The French Drain was situated below the heap leach pad and originally designed as a drain for the groundwater underneath and above the pad. This drainage was contaminated with cyanide and cyanide-complexed metals from a leak in the liner system of the heap. The French Drain sump served as the outlet for the French Drain, as well as several seeps in the vicinity. At times, the site operators pumped water from the French Drain into the CDP or the MRP, after caustic was added at the French Drain sump. The CDP, which included an inline mixer to remove the cyanide from the heap leach pad solution, also included a separate water treatment facility to adjust pH and remove cyanide, manganese and copper.[28] Caustic was added to raise the pH level to prevent corrosion of the pumps and the formation of cyanide gas, but no separate water treatment process existed at the CDP.

- **Water Treatment Plant (WTP)**. Beginning in approximately 1996, all waters to be treated on the site were directed to the Summitville Dam Impoundment (SDI) and treated at the Water Treatment Plant (WTP), which was converted from the MRP that had previously existed on the site. The WTP was retrofitted several times in an attempt to treat the water in the SDI. In 1996, a high density sludge process was used. In the next iteration of the WTP, air was introduced. Lastly, air was injected through

[28] Although defendant contends that this water treatment did not occur, the record contains treatment data from October 1993, indicating that some form of water treatment using caustics and polymers did occur. Moreover, evidence of the existence of such a plant may be found in the deposition testimony of John Trela, an ECC employee who worked at the Summitville site, as well as in several BOR reports.

diffusers at the bottom of the tank. In 1998, the use of the diffusers was deemed unnecessary and discontinued.

In general, as described by various witnesses, the EPA and the BOR attempted to address the AMD problems at the site by increasing the capacity of the various plants and by removing material from the Cropsy waste dump. By 1997, the various water treatment facilities had been integrated into what functioned, more or less, as a single, coordinated metals removal process.

D. Proceedings to Date

On January 13, 1997, plaintiffs brought suit claiming that: (i) ECC performed modifications to the PIT System that caused it to be operated at an "unlicensed" rate; (ii) defendant allowed ECC to perform this work without a license; and (iii) defendant has continued to use plaintiffs' patents without license since 1993. On April 28, 1999, defendant responded to the claim of infringement by filing a motion for partial summary judgment, requesting the court to declare the '800 patent invalid due to plaintiffs' violation of the on-sale doctrine in 35 U.S.C. § 102(b). In its order dated December 14, 1999, this court found that material questions of fact remained regarding whether the "invention later claimed" was on sale before the critical date. *CST I*, 45 Fed. Cl. at 515.

The parties subsequently raised numerous claims concerning the construction of the patents at issue. Additionally, defendant raised various assertions regarding the validity of the '497 and '800 patents. On November 7, 2000, and November 13-14, 2000, the court conducted a *Markman* hearing in this case. The court ruled orally on the issues involving the construction of the patents, reserving a fuller explanation of its reasoning for a later written opinion. Thereafter, on November 15-17, 2000, the court held trial on the factual issues raised by defendant's assertions of the invalidity of the patents. Ultimately, the court issued an opinion not only explaining the rationale for its construction of the patents in question, but also finding invalid certain of the claims under the '800 patent as in violation of the on-sale doctrine of 35 U.S.C. § 102(b) and others as obvious under 35 U.S.C. § 103(a). *See CST II*, 51 Fed. Cl. 771 (2002).

Following additional discovery, trial in this matter was conducted from October 18-25, 2004. At trial, plaintiffs called Hayes Griswold, EPA's on-scene coordinator at the Summitville site from December 1992 to approximately September 1993, who testified regarding the water treatment systems on site. Lorenza Williams, former remedial project manager (RPM) at the Summitville site from May 1993 to October 1, 1995, testified regarding her oversight duties, responsibilities and observations of the water treatment systems on site. Diane Stevenson, records keeper for CST, testified to her calculations of water throughput based on documents and daily logs produced by defendant. Mr. Stevenson testified about the '497 and '800 patent inventions, his sale of the PITS to SCMCI and his view of attendant restrictions, his observations of the Summitville site as it existed under EPA direction during alleged visits he made in 1993, 1994, 1997, and 1999, his reasonable royalty calculations, and his infringement and damages analysis in his claim charts. Finally, Dr. Jack Roth, professor of chemical engineering at

Vanderbilt University, testified as an expert on patent infringement and a reasonable royalty methodology for determining royalty damages.

Defendant called three of the witnesses called by plaintiffs – Hayes Griswold, Diane Stevenson, and Mr. Stevenson. Additionally, Frank Leitz, a chemical engineer for the BOR's Water Treatment Engineering & Research Group, testified as to defendant's involvement at the Summitville site, including the water treatment equipment and processes used at each plant, and the relationship between BOR, EPA, and ECC at the site. James E. Hanley, regional mining engineer for the EPA, and RPM from approximately 1993 to 1998, and 2001 to the present, testified about water treatment equipment and processes used at each plant, and the working relationship between BOR, EPA, and ECC at the site. Defendant also called two experts, Dr. Raymond D. Letterman, a professor of civil and environmental engineering at Syracuse University; and Dr. Abram E. Hoffman of Pricewaterhouse Coopers LLP. Dr. Letterman opined on plaintiffs' infringement claims by the water treatment apparatus and processes used at the Summitville site, while Dr. Hoffman provided expert testimony concerning damages due to plaintiffs as a result of defendant's alleged patent infringement.[29]

Plaintiffs claimed damages for infringement of between $2.9 and $11.3 million, while defendant asserted that any damages owed to plaintiffs are, at most, a minute fraction of these claimed amounts. In measuring the damages owed, both parties proffered testimony designed to assist this court in calculating a reasonable royalty rate under the so-called *Georgia-Pacific* factors.[30] Closing arguments in this case were held on April 4, 2005. Subsequently, the parties filed briefs on the issue whether this court's various *Markman* rulings were impacted by the Federal Circuit's *en banc* opinion in *Phillips v. AWH Corp*., 415 F.3d 1303 (Fed. Cir. 2005), *cert. denied*, 126 S.Ct. 1332 (2006). After carefully reviewing those briefs, the court concludes that its ultimate constructions, which were broadly based on both intrinsic and extrinsic evidence, were unaffected by *Phillips*.

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[29] Additionally, deposition testimony was introduced for a number of witnesses not called at trial, namely John Dordan, former SCMCI employee hired by ECC as plant foreman for the PITS System; Raj Devrajan, ECC's project engineer for the clean-up for the Summitville site in 1992; James Cressman, process foreman for SCMCI since 1986 and later employed by ECC as superintendent of plant operations at the Summitville Site; and John Trela, project manager for ECC at the Summitville Site.

[30] *See Georgia-Pacific Corp. v. United States Plywood Corp.,* 318 F. Supp. 1116, 1121 (S.D.N.Y. 1970), *modified, on other grounds*, 446 F.2d 295 (2d Cir.), *cert. denied*, 404 U.S. 870 (1971); *see also SmithKline Diagnostics, Inc. v. Helena Labs. Corp.*, 926 F.2d 1161, 1168 (Fed. Cir. 1991).

II. DISCUSSION

The primary question here – and, indeed, the only one this court need address – is whether defendant infringed either of plaintiffs' patents in the course of treating water at the Summitville site.

We begin with common ground. The patent statute provides that "whoever without authority makes, uses, . . . or sells any patented invention, in the United States, during the term of the patent therefor, infringes the patent." 35 U.S.C. § 271(a) (1994). "To prove direct infringement," the Federal Circuit recently stated, "the plaintiff must establish by a preponderance of the evidence that one or more claims of the patent read on the accused device literally or under the doctrine of equivalents." *Cross Medical Products, Inc. v. Medtronic Sofamor Danek, Inc.*, 424 F.3d 1293, 1310 (Fed. Cir. 2005); *see also Advanced Cardiovascular Sys., Inc. v. Scimed Life Sys., Inc.*, 261 F.3d 1329, 1336 (Fed. Cir. 2001). "[L]iteral infringement requires that each and every limitation set forth in a claim appear in an accused product." *Frank's Casing Crew & Rental Tools, Inc. v. Weatherford Int'l, Inc.,* 389 F.3d 1370, 1378 (Fed. Cir. 2004); *see also V-Formation, Inc. v. Benetton Group SpA*, 401 F.3d 1307, 1312 (Fed. Cir. 2005); *Becton Dickinson & Co. v. C.R. Bard, Inc.*, 922 F.2d 792, 796 (Fed. Cir. 1990). However, "[e]ven if one or more of the claim limitations are not literally present in the accused device, thus precluding a finding of literal infringement, the claim may still be held infringed if equivalents of those limitations are present." *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1345 (Fed. Cir. 2002) (citing *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 24 (1997)).

Although plaintiffs purport to invoke the doctrine of equivalents, they provide no particularized proof in this regard. Regarding the need for such proof, the Federal Circuit has emphasized –

> a patentee must still provide particularized testimony and linking argument as to the "insubstantiality of the differences" between the claimed invention and the accused device or process, or with respect to the function, way, result test when such evidence is presented to support a finding of infringement under the doctrine of equivalents. Such evidence must be presented on a limitation-by-limitation basis. Generalized testimony as to the overall similarity between the claims and the accused infringer's product or process will not suffice.

Tex. Instruments Inc. v. Cypress Semiconductor Corp., 90 F.3d 1558, 1567 (Fed. Cir. 1996), *cert. denied*, 520 U.S. 1288 (1997); *see also Network Commerce, Inc. v. Microsoft Corp.*, 422 F.3d 1353, 1363 (Fed. Cir. 2005); *PC Connector Solutions L.L.C. v. SmartDisk Corp.*, 406 F.3d 1359, 1364 (Fed. Cir. 2005). These cases stress that the equivalence doctrine is not some talismanic principle that cures all the ills in a literal infringement case. Plaintiffs' proof or lack thereof – especially, that deriving from its expert – typifies the "generalized testimony" that the Federal

Circuit repeatedly has held is insufficient to invoke the doctrine.[31] Indeed, as is well-illustrated by their post-trial briefs, plaintiffs do not even begin to address the concept of equivalence of function that forms the core of the doctrine. *See Hewlett-Packard Co. v. Mustek Sys., Inc.*, 340 F.3d 1314, 1323 (Fed. Cir. 2003); *see also Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 732 (2002). Accordingly, the court must reject, *ab initio*, plaintiffs' wholly undeveloped equivalence arguments.[32]

The court will consider *seriatim* plaintiffs' literal infringement claims as to each of the four water treatment facilities at the Summitville site.

A. The PIT System

With respect to the PIT System, plaintiffs' infringement claims hinge on the notion that defendant violated its patents when it increased the capacity of that system over supposed license limitations. Defendant readily admits that it substantially modified the PIT System to increase its treatment capacity, decrease its reagent requirements, and improve the efficiency with which precipitated solids were removed and concentrated. But, as it points out, plaintiffs' assertions suffer from at least two fatal flaws.

First, the record does not support plaintiffs' claim that PIT System was sold with a licensing requirement that limited its use. The ordinary rule, of course, is that, absent an express limitation, the sale of patented item carries with it an implied license to use that item in any fashion the purchaser deems fit. *See De Forest Radio Tel. & Tel. Co. v. United States*, 273 U.S. 236, 241 (1927); *Wang Labs., Inc. v. Mitsubishi Elecs. America, Inc.*, 103 F.3d 1571, 1580 (Fed. Cir.), *cert. denied*, 522 U.S. 818 (1997). As Mr. Stevenson readily admitted, the relevant sale documents neither limit the flowage rate of the PIT System nor the amount of copper that could be derived therefrom. Nor is the court prepared to find, under state law, that such a limitation was the subject of an oral agreement, in light of the strict integration clause in the purchase contract, which provided that the contract "contains the entire agreement of the parties" and that it could not "be modified or terminated orally, and no claimed modification, termination or waiver shall be binding on Buyer unless in writing signed by a duly authorized representative of

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[31] In his August 7, 2003, report, Dr. Roth referred to the doctrine in a single sentence – "I interpret any operations using the above-described method as equivalent ***even when using apparatus [sic] which may vary from the preferred apparatus described in the '497 patent to infringe upon the '497 patent.***" (Emphasis in original). But, neither in his report nor his testimony did Dr. Roth identify particular features of the various treatment plants that he deemed equivalent.

[32] Of course, even if plaintiff had properly invoked this doctrine, it would have had limited utility as to the '800 patent, which recites a detailed structure. *See Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 955 (Fed. Cir. 2006).

Buyer."[33] Accordingly, the court finds that the sale of the PIT System was not subject to a licensing requirement that limited the capacity of that system, meaning that such a limitation could not be breached when defendant modified the system.[34]

Plaintiffs, however, emphasize that the manual provided with the PIT System stated that "[a]ny duplications, changes or alterations performed on this unit or duplications from this unit without the written consent of Chemical Separation Technology, Inc. shall be in violation of CST's patent protection and shall be punishable under the patent laws of the United States of America . . . ." While defendant and its agents plainly did not obtain CST's permission to modify the PIT System, that does not give rise to any violation of the patent laws for at least two reasons. First, the language in the manual was unilaterally issued by CST and does not appear to be binding upon the parties in light of the integration clause in the purchase contract. Indeed, the manual apparently was not provided to SCMCI until after the sale was consummated. Plaintiffs thus simply are wrong in suggesting that the manual was incorporated into the purchase order for the PIT System.[35] Second, even if somehow effective, the cited language, at best, constituted a warning that the modification of the system could violate the patent law and be punishable thereunder. Plaintiffs, even by contract, could not usurp the role of Congress – they could neither cause the modifications to be viewed as violations of the patent laws, if they were not, nor provide for the punishment thereof under those laws, if such punishment was not statutorily authorized. A few words of elaboration on the latter point are in order.

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[33] This conclusion obtains whether the purchase agreement is viewed as controlled by Pennsylvania law, *see, e.g., Yocca v. Pittsburgh Steelers Sport Inc.*, 854 A.2d 425, 437 (Pa. 2004), or Colorado law, *see, e.g., Keller v. A.O. Smith Harvestore Prods*., 819 P.2d 69, 72 (Colo. 1991).

[34] The court is aware that in its initial opinion in this case it stated that such a license existed. *See CST I*, 45 Fed. Cl. at 515 n.3 ("The PIT System was sold under a license to treat 100 gallons per minute and to precipitate out 40 pounds of minerals (specifically copper, a non-ferrous mineral) a day."). That statement, however, was made in the context of reviewing defendant's partial motion for summary judgment and reflected a concession made by defendant only for purposes of that motion. The statement thus did not reflect any factual analysis and does not bind the court. Indeed, at the more recent trial, plaintiffs clearly were aware that the existence of the license was among the factual issues to be tried.

[35] In arguing otherwise, plaintiffs point to language in the purchase order which requires that "[a]ll invoices, packages, shipping notices, instruction manuals and other written documents affecting this order shall contain the applicable purchase order number." But, this clause plainly does not mean that every document subsequently produced by CST that included a purchase order number somehow was to become part of the original agreement, a clause that would be tantamount to allowing plaintiffs unilaterally to modify the contract at will. And plaintiffs have provided no evidence – parol or otherwise – that would lead this court to conclude otherwise.

"The purchaser of a patented article," the Federal Circuit has stated, "has the rights of any owner of personal property, including the right to use it, repair it, modify it, discard it, or resell it, subject only to the overriding conditions of the sale." *Jazz Photo Corp. v. Int'l Trade Comm'n*, 264 F.3d 1094, 1102 (Fed. Cir. 2001), *cert. denied*, 536 U.S. 950 (2002); *see also Aro Mfg. Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 346 (1961); *McCoy v. Mitsuboshi Cutlery, Inc*., 67 F.3d 917, 921 (Fed. Cir. 1995), *cert. denied*, 516 U.S. 1174 (1996). Thus, patented articles, when sold, "become the private individual property of the purchasers, and are no longer specifically protected by the patent laws." *Mitchell v. Hawley*, 83 U.S. (16 Wall.) 544, 548 (1872); *see also Jazz Photo*, 264 F.3d at 1102; *Hewlett-Packard Co. v. Repeat-O-Type Stencil Mfg. Corp.*, 123 F.3d 1445, 1451 (Fed. Cir. 1997), *cert. denied*, 523 U.S. 1022 (1998) ("Generally, when a seller sells a product without restriction, it in effect promises the purchaser that in exchange for the price paid, it will not interfere with the purchaser's full enjoyment of the product purchased."). "This implied license covers both the original purchaser of the article and all subsequent purchasers," *Bottom Line Management, Inc. v. Pan Man, Inc*., 228 F.3d 1352, 1354 (Fed. Cir. 2000), such as the United States here. While the rights of ownership do not include the right "to construct an essentially new article on the template of the original," *Jazz Photo*, 264 F.3d at 1102, *see also Aro Mfg. Co.*, 365 U.S. at 346, there is no indication that occurred here, at least insofar as the modifications made to the PIT System. Rather, plaintiffs asserts – and the record reflects – that defendant simply modified the PIT System primarily to increase its capacity.

A wealth of authority indicates that such modifications do not constitute violations of the patent laws. As the Federal Circuit noted in *Hewlett-Packard*, 123 F.3d at 1452, the Supreme Court's decision in *Wilbur-Ellis Co. v. Kuther*, 377 U.S. 422 (1964), is particularly instructive on this point. In the latter case, the patentee sued the purchaser of patented fish-canning machines after the purchaser modified the machines. As originally constructed, the machines packed fish into one-pound cans, but the purchaser had six of thirty-five elements of the machines resized so that the machines would pack fish into smaller five-ounce cans. Refusing to treat the unrestricted sale of the machines as a license for use on one-pound cans only, the Supreme Court reasoned:

> [T]he . . . machines were not spent; they had years of usefulness remaining though they needed cleaning and repair. . . . When six of the 35 elements of the combination patent were resized or relocated, no invasion of the patent resulted, for as we have said the size of cans serviced by the machine was no part of the invention; nor were characteristics of size, location, shape and construction of the six elements in question patented. Petitioners in adapting the old machines to a related use were doing more than repair in the customary sense; but what they did was kin to repair for it bore on the useful capacity of the old combination, on which the royalty had been paid.

Id. at 424-25. The Court concluded that changing the machine was thus permissible under the patent laws. *Id*.; *see also Mitchell*, 83 U.S. (16 Wall.) at 548 (when the sale of a patented article "is absolute, and without any conditions, the rule is well settled that the purchaser may continue

to use the implement or machine purchased until it is worn out, or he may repair it or improve upon it as he pleases, in the same manner as if dealing with property of any other kind").

In modifying the PIT System, defendant likewise acted within the authority granted by plaintiffs' unconditional sale of the drainage treatment apparatus. As such, assuming *arguendo* that breach of a licensing limitation could give rise to infringement, rather than simply a breach of contract, there was neither infringement nor a breach here. This result is confirmed not only by the rationale of *Wilbur-Ellis*, but by the analogous holdings in a phalanx of Federal Circuit decisions. *See Husky Injection Molding Systems, Ltd. v. R & D Tool Eng'g Co.*, 291 F.3d 780, 786-87 (Fed. Cir. 2002) (modification of molds and carrier plates in injection machine not a patent violation); *Jazz Photo*, 264 F.3d at 1102-03 ("The purchaser of a patented article has the rights of any owner of personal property, including the right to use it, repair it, modify it, discard it, or resell it, subject only to overriding conditions of the sale."); *Surfco Hawaii v. Fin Control Sys. Pty, Ltd.*, 264 F.3d 1062, 1066 (Fed. Cir. 2001), *cert. denied*, 536 U.S. 939 (2002) (sale of replacement fins for surfboard with different characteristics from original, unspent fins – held not patent violation); *Hewlett-Packard Co.*, 123 F.3d at 1451 (modification of ink cartridges to allow them to be refilled not a patent violation); *McCoy*, 67 F.3d at 921 ("'an authorized sale of a patented product places that product beyond the reach of the patent'") (quoting *Intel Corp. v. ULSI Sys.Tech., Inc.*, 995 F.2d 1566, (Fed. Cir. 1993), *cert. denied*, 510 U.S. 1092 (1994)); *see also* Donald S. Chisum, 5 Chisum on Patents § 16.06[3] (1997) (citing additional cases). Plaintiffs cite no cases to the contrary and research reveals none.

Notably, the courts have made short shrift of the notion that the patentee's unilateral intention to limit the modification of a patented item – as reflected, for example, in the manual for the PIT System – somehow independently operates to impose limitations on the use of a purchase item. Thus, in *Hewlett-Packard*, *supra*, in which the alleged infringer purchased ink cartridges and then modified them to make them refillable, the Federal Circuit rejected a similar "intent of the patentee" theory, indicating that, to be actionable, limitations on the use of a product must be express and bilateral. Rejecting a contrary construction of the Supreme Court's decision in *Wilson v. Simpson*, 50 U.S. 109, 125-26 (1850), it stated that "absent a restriction having contractual significance, a purchase carries with it the right to modify." *Hewlett Packard*, 123 F.3d at 1453. It reasoned –

> The question is not whether the patentee at the time of sale intended to limit a purchaser's right to modify the product. Rather the purchaser's freedom to . . . modify its own property is overridden under the patent laws only by the patentee's right to exclude the purchaser from making a new patented entity. Each case turns on its own particular facts, but a seller's intent, unless embodied in an enforceable contract, does not create a limitation on the right of a purchaser to use, sell, or modify a patented product as long as a reconstruction of the patented combination is avoided. A noncontractual intention is simply the seller's hope or wish, rather than an enforceable restriction.

Id. It thereby concluded that "even though HP clearly intends the filled cartridges which it sells to be discarded after a single use, HP cannot use the patent laws to impose restrictions on the cartridges' use after selling them unconditionally." *Id*. at 1454.

Thus, even if plaintiffs subjectively intended to limit the use of the PIT System, their failure to embody that view in an enforceable contract prevents this court from treating the modifications as a patent violation. *See also Jazz Photo*, 264 F.3d at 1106. Accordingly, the court finds that the modifications made by defendant to the PIT System did not infringe upon plaintiffs' patents.[36]

B. The Remaining Treatment Facilities

Of course, defendant did not have a license to use the technology embodied by the '497 and '800 patents in any other apparatuses. Plaintiffs contend that defendant, nonetheless, made such use by incorporating their technology into three other AMD treatment facilities at the Summitville mine site. They assert that each of these facilities infringe claims 3 through 9 of the '497 patent and at least claim 22 of the '800 patent. But, setting aside, for the moment, whether each of the elements of the claims may be found in those facilities, there are two overarching problems with plaintiffs' contentions.

First, their infringement claims rely heavily on the testimony of Mr. Stevenson, who matter-of-factly testified that key elements of the patents were incorporated into the treatment facilities at the Summitville site. Mr. Stevenson based his testimony, in large part, on observations that he claimed to have made in 1994 or 1995, while taking an unauthorized and unaccompanied tour of what, by then, had been designated a highly toxic Superfund site. He asserted that he was able to steal away from the others on that trip and perform this highly useful survey despite evidence indicating that the mine area was secured and guarded and that the water treatment plants involved were widely dispersed over rugged and elevated terrain. Yet, Mr. Stevenson could provide few details as to how he managed to traverse the property undetected. Nor could he satisfactorily explain how, on the one hand, he could admit to not seeing the interior of the various tanks, yet, on the other, readily provide details as to features that other evidence plainly reveals were not visible from the outside of the plants. Rather, he asserted that he knew what features of the patents were being employed because of the color of the water being treated – a fanciful concept that assumes, contrary to the record, that the treatment method at issue yielded water with a unique chromaticity. Moreover, Mr. Stevenson's self-serving claims wilted under cross-examination, particularly when he was confronted with deposition

[36] Even were the court to conclude otherwise, it is apparent that the PIT System employed at Summitville, even though designed by CST, lacked various features reflected in the patents. For example, the record indicates that soon after ECC took over the property, it ceased using the aerator in the PIT System, going so far as to cover the intake holes for that equipment using duct tape.

testimony in which he indicated that he had not seen the plants, at least after 1993.[37] Confirming this deposition testimony, the detailed claim charts that Mr. Stevenson prepared in 2002 did not refer to this supposed visit and, indeed, indicated variously that "additional discovery" was needed to prove elements that Mr. Stevenson, at trial, was certain that he had personally witnessed years before, during his surreptitious visit to the site. The latter claims simply prove too much.

In ruling on the validity of the patents at issue, this court previously found testimony from Mr. Stevenson to be "utterly incredible." *CST II*, 51 Fed. Cl. at 806. Unfortunately, the record here leaves the court with no choice but to conclude that his testimony regarding his supposed 1994 or 1995 visit to the site is no more credible. Hence, the court must discount entirely the observations that Mr. Stevenson made based upon this supposed site visit, a finding that, as will be seen, only adds to the deficiencies in plaintiffs' proof.

Second, in asserting that their patents were infringed by the other water treatment facilities, plaintiffs greatly simplify and broaden the elements of their patents, ignoring, despite protesting to the contrary, the precision represented not only by the language of the patents, but this court's *Markman* rulings. Indeed, both at trial and in their post-trial briefs, plaintiffs proceed as if their patents covered virtually any form or sequence of AMD treatment that involves the addition of a neutralizing agent, the use of a polymer, agitation, and aeration or other forms of oxidation. But, the question here is not whether a given treatment plant was "PITS-like." Rather, as this court's prior rulings make clear, the language of the '800 patents requires a particular orientation of the aforementioned steps, while the '497 patent teaches that the components of the apparatus must be arrayed and oriented in a particular fashion. The importance of these features was emphasized by plaintiff and the PTO in the prosecution history of the patents and it was because of them that this court upheld various claims in plaintiffs' patents as against a barrage of invalidity arguments based upon prior art and theories of

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[37] In one deposition passage, Mr. Stevenson testified that he had visited the French Drain Treatment Facility after the EPA took over the site. When asked if he knew how that facility later operated, he stated that "I don't know the total exact way it was treated other than by drawings," adding that "[a]fter that first visit, I was forbidden to go and look at any of those sites by the government." At another point in his deposition, Mr. Stevenson was asked –

> Q: Did you ever see the Cropsy water treatment plant?
>
> A: No. I did not.
>
> Q: So your support in the claim chart that you provided is from what you glean from documentation?
>
> A: That's correct.

obviousness and anticipation.[38] Having successfully defended their patents, at least in part, plaintiffs cannot now jettison that same specificity to facilitate proof of infringement. As is well-settled, the patentee may not "ascrib[e] to one element of the patent combination the status of the patented invention itself," as "there is no legally recognizable or protected 'essential' element, gist or 'heart' of the invention in a combination patent." *Aro Mfg. Co.*, 365 U.S. at 344-45.[39] Rather, "'[t]he invention' is defined by the claims." *Vas-Cath Inc.*, 935 F.2d at 1565; *see also Allen Eng'g Corp.*, 299 F.3d at 1345. And as to the Cropsy Water Treatment Plant, the French Drain Treatment Plant and the Water Treatment Plant, plaintiffs have taken precisely the pathway forbidden by *Aro Mfg.* and its progeny, as the following more detailed discussion of the individual elements of the relevant claims of the patents makes abundantly clear.

1. The Cropsy Water Treatment Plant (CWTP)

Claim 3 of the '497 patent requires that the treatment unit have an "aerator means . . . having a shaft extending therefrom into said treatment unit and, said aerator means having agitation means." Although there is conflicting evidence on this point, the weight of evidence – including a variety of schematics prepared by the BOR and ECC, as well as testimony from

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[38] For example, before the PTO, one of the patents that plaintiffs had to distinguish from what would become the '497 patent was Spinola (No. 3,441,008), which also included a method and apparatus for treating acid wastewater by aeration, oxidation and neutralization in a reaction vessel. In seeking to distinguish Spinola, plaintiffs stated to the PTO that "the aerator having agitation means used by Applicants is concentrated and contained, while Spinola's is uniformly distributed." On other occasions, plaintiffs argued to the PTO that –

> [n]ot only do Applicants add the three constituents (neutralizing agent/ wastewater/oxidizing gas) at the same point, it attempts to contain these constituents together for a short period of time as demonstrated in the mixing pipe work . . . . It is advantageous to add all three at generally the same point at generally the same time, for at this point and within the confines of the internal piping, the pH is elevated. However, the waters in the tank bath which are the waters remaining outside this pipe-work and point of injection are at a lower pH. The whole point is that oxidation reactions are accelerated greatly at higher pH's and is preferred that these be introduced at generally the same point at generally the same time in sufficient quantities to have these reactions properly take place.

Indeed, it is apparent that based upon this representation, as well as others in the wrapper, plaintiffs would not have received patents for a process or apparatus as broad as they now claim. Plaintiffs, of course, made similar claims in convincing the court of the partial validity of the patents. *See, e.g.*, *CST II*, 51 Fed. Cl. at 796-99.

[39] *See also Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1345 (Fed. Cir. 2002); *Vas-Cath, Inc. v. Muhurker*, 935 F.2d 1555, 1565 (Fed. Cir. 1991).

several credible witnesses – reflects that the CWTP never contained an aerator means. And it is irrefutable that if such an aerator existed, it did not have the requisite shaft and associated agitation means. Functionally speaking, this treatment plant did not have an aerator means because the iron being treated came from the Heap Leach Pad, where it had already been well-oxidized to the ferric form by extended exposure to air.[40] Accordingly, while the tanks were open to the atmosphere while the water was being agitated, aeration was not part of the treatment process. Because the CWTP did not contain an aerator means, it also neither met the elements of claim 3 of the '497 patent that required an influent pipe to be "generally adjacent to the discharge end of said aerator shaft" and that provided that a neutralizing agent feed line means be disposed "generally adjacent to the exit of said aerator means."[41] And, even were this not true, claim 3 of the patent requires that the method occur in "a treatment unit," whereas testimony, drawings and pictures all confirm that the CWTP was comprised of two reactor tanks, both designed to enhance the chemical reactions by increasing the mean fluid residence time, as well as a separate

[40] The parties' experts differed on whether they believed that exposure to atmospheric oxygen could cause ferrous iron to be oxidized to ferric iron. The court credits the testimony of defendant's expert, Dr. Letterman, because his explanation – both at trial and in his report – not only was the most comprehensive and made the most sense, but was in accord with several other documents that suggested that waters from the heap leach pad did not need further oxidization. His testimony was corroborated by the testimony of two ECC employees – John Trela, a project manager at the Summitville site, and Raj Devarajan, a project engineer at the site.

[41] In its *Markman* ruling, this court construed the term "adjacent" as meaning "close to; lying near" or "next to," noting that an object of the invention "is to introduce the water, the neutralizer and the oxidant at essentially the same point and time in the process flow." *CST II*, 51 Fed. Cl. at 788. Even if the CWTP included an aerator in the first reaction tank, the evidence shows that the neutralizing agent was added by a metering pump ahead of that tank.

tank where flocculation occurred after a polymer was added.[42] Accordingly, the CWTP plainly did not infringe claim 3 of the '497 patent.

The CWTP also did not infringe claims 4-9 of the '497 patent, basically for three reasons. First, each of these claims is dependent on claim 3 of the patent, and it is "axiomatic that dependent claims cannot be found infringed unless the claims from which they depend have been found to have been infringed." *Wahpeton Canvas Co. v. Frontier, Inc.*, 870 F.2d 1546, 1553 (Fed. Cir. 1989).[43] Second, the CWTP did not employ an oxidant and thus did not meet the specific requirement of claim 4 that the oxidant added under the process be air, or the requirement of claim 5 that the neutralizing agent and oxidant be "substantially simultaneously introduced into said water." As to the latter claim, various BOR and ECC schematics indicated that sodium hydroxide was introduced into the influent pipe before the water flowed into the first reaction tank and was introduced a second time between the first and second reaction tanks. Finally, because it drew its water only from the French Drain sump and the Heap Leach Pad, the treatment plant neither removed water from a stream, as required by claims 7 and 8, nor discharged water into the same stream from which it was removed, as required by claim 8.[44]

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[42] As part of the *Markman* process, the court was not asked to construe the phrase "a treatment unit," as used in claim 3. Defendant contends that two or more reactor vessels in a sequence do not meet this requirement, while plaintiffs assert that the term can include multiple tanks. The latter view, however, clashes with parts of the patent that emphasize the portability of the treatment apparatus and the method associated therewith. *See CST II*, 51 Fed. Cl. at 785 n.7 ("the preamble to the patent, as well as the summary of the invention, repeatedly emphasizes that the apparatus associated with the patent is portable"); *see also, e.g.*, '497 patent, col. 1, ll 48-50 ("There remains a need for such a device which is adapted to be used in any type of water source and which may be easily transportable"); *id*. at col. 4, l. 45 ("[t]he unit can be readily transported"). It also cannot be squared with references that the main chemical reactions are intended to occur in a single tank or reaction vessel, such that, according to the description of the preferred embodiment, "bulk mixing and reaction chambers are not needed." *Id*. at col. 4, ll. 39-40; *see also, e.g.*, *id*. at col. 4, ll. 1-4. Nothing in the patent suggests the potential use of more than one vessel or tank in a series, which approach would be inconsistent with other portions of claim 3, as well as other claims in the patent, that anticipate that the various steps in the process would occur in close proximity within a given treatment tank roughly at the same time. Thus, the intrinsic evidence points to a conclusion that the treatment unit referenced in claim 3 does not encompass multiple reaction tanks of the sort employed in the CWTP. *See Phillips*, 415 F.3d at 1312-17 (emphasizing the preeminence of intrinsic evidence).

[43] *See also Hoffer v. Microsoft Corp.*, 405 F.3d 1326, 1331 (Fed. Cir. 2005); *Minn. Min. & Mfg. Co. v. Chemque, Inc.,* 303 F.3d 1294, 1299 (Fed. Cir. 2002); *Jeneric/Pentron, Inc. v. Dillon Co.*, 205 F.3d 1377, 1383 (Fed. Cir. 2000).

[44] Various intrinsic evidence, including not only the claims of the patent, but also the specification, make clear that the "stream" mentioned in these claims is a natural flow of water, such as a brook, rivulet or small river, and not simply a steady current of fluid.

Finally, nothing in the record indicates that the method employed in the CWTP "substantially instantaneously elevated" the water's pH, as required by claim 9 of the '497 patent – indeed, as mentioned above, the pH of the water flowing into the CWTP was adjusted before it reached the first reaction tank.[45] Again, contrary assertions made by Mr. Stevenson were based upon observations that this court is confident did not occur.

Turning to claim 22 of the '800 patent, the only claim that plaintiffs seriously pursue as to this plant,[46] recall that claim requires that an anionic polymer be added for settling purposes. The record, as a whole, does not indicate that an anionic polymer was employed at the CWTP; rather, as both Mr. Stevenson and Dr. Roth conceded, the evidence, including operational guidelines for the CWTP, indicates that a cationic polymer was employed. Accordingly, the CWTP did not infringe the '800 patent.

2. The French Drain Treatment Plant (FDTP)

Many unresolved questions remain as to how the French Drain treatment plant was actually configured and operated, engendered, in part, because the treatment that occurred here was less structured and more variable than that of the other treatment plants. While the parties agree that caustic was added at the French Drain sump to raise the pH of the AMD to prevent cyanide gas from forming and to prevent corrosion of the pumps, they agree as to little else regarding this facility. Plaintiffs rely heavily on schematics for this plant that include details that defendant contends were proposed, but never implemented. Nonetheless, it is significant that even these detailed schematics, which present the best possible case for infringement, provide little in the way of details concerning what was inside the tanks and lack key elements of the patents at issue.

For example, although claim 3 of the '497 patent requires an "aerator means," there is no indication that the FDTP actually contained such an apparatus, let alone one which conformed to the specific elements of the patent (*e.g.*, one that had a shaft extending into the treatment unit,

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[45] Defendant's expert, Dr. Letterman indicated that to produce such an instantaneous elevation in pH, the caustic would have to have been introduced in a contained area, of which there was no evidence.

[46] At points, plaintiffs appear to assert that the CWTP infringed on claim 1 of the '800 patent. But, it appears that the process employed in the CWTP was substantially different from that in the patent as it did not involve adjusting the pH, aerating the wastewater, and agitating the wastewater in any type of contained area, let alone a reaction tank that would meet the specific requirements of claim 1 of the '800 patent. In arguing that these specific elements were met, plaintiff's expert, Dr. Roth amalgamated the various steps into what he referred to as a "continuous" process. But, it appears that what he described, which in many ways served only to distinguish the '800 patent from a batch treatment process, is a much broader concept than what is described in claim 1 of the patent.

and an agitation means, and influent pipes adjacent to the discharge end of the shaft).[47] Further, as amplified in the testimony of Mr. Leitz and by several diagrams, it appears that caustic was injected into the influent line and not directly into the tank because the water coming from the French Drain contained not only AMD, but also cyanide – the latter needed to be neutralized before treatment to prevent the formation of deadly cyanide gas. As such, the FDTP also did not meet the element of claim 3 of the '497 patent that required the neutralizing agent feed line be generally adjacent to the exit point of the aerator means. Likewise, the schematics do not reveal any form of agitation in the tank, making it impossible for plaintiffs to prove other key elements of claim 3.

Nor is there any indication that, as required by claims 4 and 5 of the '497 patent, the treatment method used in the FDTP introduced an oxidant (with air being the only one indicated) and any neutralizing agent "substantially simultaneously." And, as with the CWTP, the FDTP did not draw water from a stream and thereby did not meet the requirements of claims 7 and 8 of the '497 patent to the extent that they required that the water be drawn from a stream and returned back thereto. Finally, there is no indication in the schematics or any other part of the record that the FDTP employed a version of the patent's method that "substantially instantaneously" elevated the pH of the influent – rather, this process appears to have occurred as the water flowed through several pipes and reaction tanks. And, again, even were all the details in these dependent claims present, the absence of the various other elements of claim 3 of the '497 patent would still mean that there is no infringement.

Plaintiffs fare no better, regarding the FDTP, as to their assertions regarding infringement of the '800 patent. Thus, for example, there is nothing in the schematics or otherwise that indicates that aeration and agitation occurred in the FDTP, let alone that those steps occurred "simultaneously in a reaction tank," as required by claim 1 of the '800 patent. Moreover, while claim 1 required that the waste water be aerated "to provide a dissolved oxygen concentration at from about 0.01 lb./hr. to about 70 lbs./hr. at a waste water input flow rate of from about 50 gal./min. to about 500 gal./min.," there is no evidence, beyond pure conjecture, as to whether any oxygen was added to the waste water flowing through the FDTP[48] or the input flow rate at the FDTP. In addition, while water treatment data suggests that an anionic polymer may have been used in this treatment process for a few days, the record does not support either a finding that a polymer was generally used at the FDTP, as required by claim 1 of the '800 patent, or that such a polymer was an anionic polymer used for settling purposes, as required by claim 22. Hence, plaintiffs have not shown that the FDTP, in any of its various alleged configurations, infringed the '800 patent.

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[47] Several diagrams show the term "AIR" with arrows pointing into the two reaction tanks, but provide no details of piping or other means for introducing the air. The other diagrams upon which plaintiffs rely do not even provide this much detail and thus are a far cry from what is needed to demonstrate the elements of claim 3.

[48] Dr. Letterman testified that, in some circumstances, the waste water could be fully oxidized, so that no additional oxygen whatsoever would be absorbed in the process.

3. The Water Treatment Plant (WTP)

Beginning about 1996, all waters to be treated on the site were directed to the Summitville Dam Impoundment and treated in the WTP, which was converted from the MRP. The WTP went through several iterations in an attempt to treat the water in the Impoundment. Plaintiffs allege that the WTP infringes claims 3-9 of '497 patent, and claim 22 of '800 patent, operating from 1996 to the present, and treating approximately 435 million gallons of water through 1998.

In terms of the '497 patent, the record reveals that, like the CWTP, the WTP employed two reactors in a series in which portions of the oxidation and neutralization reactions sequentially took place and thus did not involve a single treatment unit, as required by claim 3 of the patent.[49] Further, while the WTP employed various forms of aerators, none of these had agitation means or had a neutralizing agent feed line means disposed generally adjacent to the exit of said aerators, so as to meet other elements of claim 3. Rather, it appears from BOR diagrams that, during the time the WTP employed spargers and then diffusers (ultimately both were abandoned as unnecessary), the neutralizing agent, principally in the form of lime, was introduced at a different part of the reaction vessels many feet away from the aerators.[50] As such, it is also clear that the configuration of the WTP did not meet the elements of claim 5 of the '497 patent, which required the neutralizing agent and oxidant to be "substantially simultaneously introduced into said water." This facility, which drew water from a holding pond, also did not meet the elements of claims 7 and 8 of the '497 patent, which, again, required the facility to interact directly with a stream, nor did the method employed therein instantaneously elevate pH,

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[49] In particular, various diagrams, as well as testimony from Messrs. Leitz and Trela, indicate that, at some point, lime was added in the first vessel or in the line between the two vessels; the pH of the water was measured near the discharge point of the second reactor, leading to the lime feed rate being automatically adjusted. Indeed, the fact that this process used lime for neutralization, rather than a caustic, is itself significant. Notably, in their response to the second rejection of their original patent application, the '497 patentees emphasized to the PTO that their process was distinguishable from Spinola because "Spinola or any lime or limestone system is impractical for real-time, on-line control," adding further that "to persons knowledgeable of acid mine drainage and associated treatment chemistry, the two methods are grossly different in reaction kinetics and nuances of operating characteristics that it is truly an apples and oranges comparison."

[50] It should be noted that in attempting to cobble together an infringement claim, plaintiffs pick and choose elements from different iterations of the WTP and proceed as if all these were present simultaneously. Such an approach, of course, does not meet plaintiffs' burden of proof.

as required, by claim 9 of the '497 patent, as it instead sought to keep the oxidation and neutralization rates low to promote the formation of large floccules.[51]

Finally, the WTP did not infringe upon claims 1 and 22 of the '800 patent essentially for the same reasons listed above for the FDTP (although the WTP, unlike the FDTP, did, at times, include aerators). In particular, the court rejects Mr. Stevenson's claims that he knew that all of the elements of these claims were being practiced at the FDTP because of the "ruby red" color of the water being treated, as the court does not believe that Mr. Stevenson ever saw this process. And even if he had observed this, there is nothing in the record, by way of scientific evidence or otherwise, that suggests that one could determine the oxygen content of AMD, let alone the orientation of various apparatuses, by virtue of the color of the influent or effluent being processed.

III. CONCLUSION

In sum, from a factual standpoint, this is not a close case. Based on the foregoing, the court finds that defendant did not infringe upon plaintiffs' patents. Accordingly, no damages are owed by defendant to plaintiff. The Clerk is ordered to dismiss plaintiffs' complaint.

IT IS SO ORDERED.

s/Francis M. Allegra
Francis M. Allegra
Judge

[51] In this regard, Mr. Leitz testified that lime was injected gradually into the process because of a desire "to make these, as much as possible, a slow progression of neutralization," emphasizing further that "[w]e're making the reaction go as slowly as we can."